A look into molecular transport mechanisms through the use of *in situ* methods

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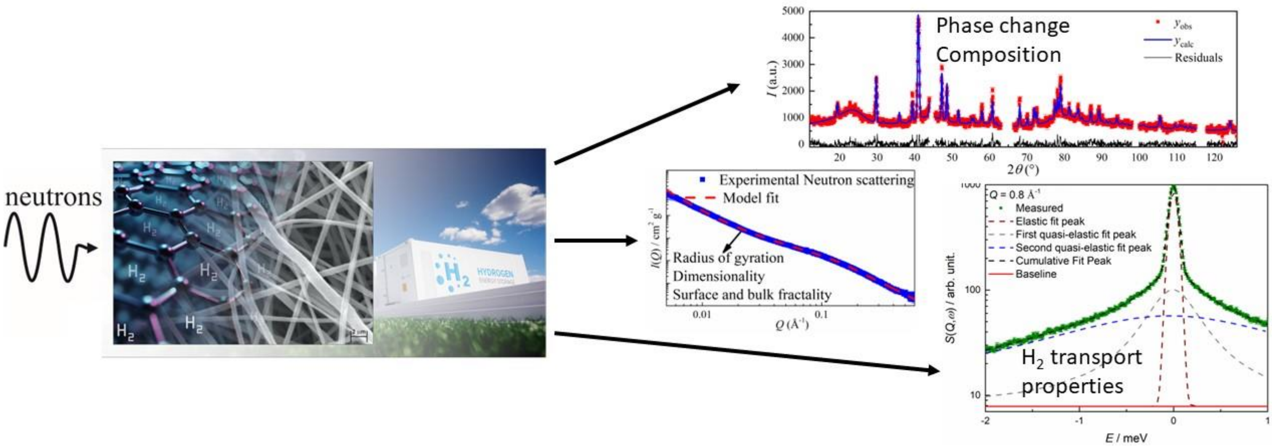
Transport processes at interfaces, in bulk, and the adsorbed phase play a crucial role in energy storage systems, e.g., supercapacitors, batteries, and H_2 adsorbents. Through the thorough characterization of the electrode or adsorbent materials' structural and porous characteristics and the application of *in situ* neutron scattering methods it is possible to determine the adsorbing species transport properties at different adsorption sites. The capability of different types of porosities to confine H_2 is determined with the use of *in situ* quasi-elastic neutron scattering, where the exact properties of the porous structures are determined with small angle neutron scattering and complementary physical characterization methods.[1,2] The strong influence of pore geometry on the confining capability of H_2 and the reversible structural changes of the adsorbents under H_2 loading are shown with *in situ* neutron scattering methods.[3] Based on these and other examples the effective use of *in situ* methods for the characterization of otherwise difficult-to-probe processes and systems are showcased.



Scheme: A schematic of different neutron scattering methods yielding *in situ* information of different processes dealing with crystalline phase changes, adsorbent porous structure, and adsorbed phase transport properties.

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